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MANIPULATION AS A THERAPEUTIC MEASURE.

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THIS subject is a very wide one, and has a medical, as well as a surgical, aspect. As a surgeon specializing in orthopædic work, I can only deal usefully with those problems which are associated with my practice. Manipulation, though an important weapon in the hands of the orthopædic surgeon, must be considered by him as only one of many. He is called upon to decide not merely which of the many types of movements he will employ, but whether *any* are needed, and to point out the dangers which may be encountered if manipulation is prescribed for the wrong case. I will limit my remarks to those movements, forced or gentle, which have as their object the restoration of function in joints or muscles affected by injury or disease, or disabilities due to prolonged rest. The subject cannot be adequately dealt with if we fail to consider the preventive side, for it will be conceded by all that in a considerable proportion of cases manipulations are the necessary sequelæ to faulty diagnosis and treatment. My conclusions are drawn from my own experience, and however imperfectly I approach this subject I shall be quite content if I can be of any help in deciding when movements are necessary and when they should be avoided.

For the purposes of the moment I shall use the term manipulation as it is applied to the treatment of adhesions, to the reduction of common displacements, and to the manual rectification of a few congenital and acquired deformities, and further endeavour to assess the proportional value of active volitional as compared with passive movements. I shall do no more than allude to muscular movements induced by faradism or galvanism—useful though they often are—or any of the many forms of electro-therapy.

Adhesions.—We may assume that a joint is stiff owing to the presence of adhesions, either within or without, or both. They may complicate disease or be the sole cause of stiffness.

An adhesion is a band restricting movement between adjacent tissues, due to an effusion, serous or hæmorrhagic, following injury or disease. At its birth it is soft and yielding; at a later stage it becomes fibrous and inelastic, more dense and less vascular, reaching a final stage which may be called cicatricial.

The division into classes, 'which we term extra- and intra-articular, is useful, although largely artificial.

We find that *extra-articular* adhesions, as the name implies, stiffen a joint by the involvement of surrounding structures. They may be found in the capsule, in the ligaments, in the muscles, or in the tendon sheath. They may interfere with the mobility of a joint from adaptive shortening of muscle or other structure, the result of strain or even posture. They are met with in myositis ossificans and Volkmann's ischæmic palsy, and in many scars about joints.

The *intra-articular* variety may also be due to trauma, frequently associated with infection. It may merely consist of a fixation between folds of the synovial membrane or adjacent capsule, or of any tissue within the joint cavity. Adhesions may also owe their origin to fractures or dislocations of the joints, or to acute and chronic infections.

Adhesions related to injuries, such as strains or fractures, or luxations, require more radical treatment than those associated with definite destructive infections. If adhesions are allowed to form following injuries, either within or without the joint, they call for active, passive, or even forcible, movements. If they are the result of inflammatory lesions, such as arthritis, rest is indicated until active disease and pain are modified, or complete recovery has taken place.

I shall define arthritis as a condition involving bone or cartilage, or both, in contradistinction to a simple synovitis. The mistakes made by the unqualified practitioners are often the result of a false diagnosis. Arthritis is often treated by them as if it merely required the breaking down of adhesions, while our own profession is apt to confuse the two conditions and to allow the simple adhesions to become cicatricial by giving the joint unnecessary and harmful rest. I will, therefore, once more lay down a rule which, with few exceptions, will stand the test whereby we are enabled to make a differential diagnosis.

A differential diagnosis.—A joint whose movement is limited in *all* directions is, or has been, subject to arthritis, while a joint which is limited in certain directions only, movement being normal in others, is not arthritic. This is more obvious in joints movable in many directions—such as the wrist, hip, shoulder, and spine—than in the knee or elbow where movement is mainly one of flexion and extension. This does not apply to septic infections involving the articular or periarticular tissues, or to fractures within the joints, or to joints temporarily stiffened from long fixation.

It is well to remember that a joint whose movement is not limited in every direction is free from arthritis. Again, if we cannot find any limitation of movement in a joint it is free from both arthritis and adhesions. We must, however, know precisely the movements of which normal joints are capable. This is especially the case in the knee and shoulder and the complex articulations of the foot.

The spinal column is a good concrete example to illustrate the differential diagnosis. A patient may complain of pain in the back, with or without pressure, and he is asked to flex, extend, rotate, and laterally move his spine. If he does this freely in each direction we may safely affirm that there is freedom from both arthritis and adhesions. If he cannot flex it fully or deviate it laterally, or rotate it, but can hyperextend it normally, we may assume the absence of arthritic changes. We are usually safe, therefore, in deciding that a spine with movements limited in all directions is arthritic; and further, if one or more of its movements is normal in range we can exclude the presence of arthritis.

There are many other helpful differential signs which I cannot discuss in the time allowed to me. I may mention, however, that stiffness rapidly following trauma—excluding fractures and displacements—is suggestive of adhesions. The same is true of superficial tenderness over a limited area, either on movement or pressure, or both. In arthritis the joint is generally warmer over the whole articulation, and although adhesions may produce a localized rise of temperature we usually find no difference from the normal. We note that muscular wasting in an inflamed joint is in excess of that caused by mere desuetude; this is not the case in adhesions.

Radiography here, as in all branches of medicine, is an essential aid to diagnosis. No matter how experienced we may be, we cannot afford to dispense with it, even in the apparently simple and obvious case. Not only should we insist upon procuring a film, but it is equally important that we should welcome the radiologist's

reading of it. Some surgeons resent this and say, "Give me the film so that I can read it for myself": but this is an arrogant and stupid attitude, and not to the patient's advantage. In Liverpool I constantly, and with profit, confer with my friend Thurstan Holland. Radiography is not merely called for as an immediate measure, but is of immense value in a case of long standing, especially in the adult. There are many cases in which a patient has complained for months of a stiff and painful joint. If a skiagram betrays no changes in the joint surfaces we are generally safe in assuming the absence of tuberculous, septic, or rheumatic invasion, and this knowledge is of inestimable clinical importance. Although this does not exclude synovial tuberculosis in the young, or a villous affection of the synovial tissues in the late adolescent or an enlarged post-patellar pad, or a displaced semilunar cartilage, there are other signs to which we can appeal in order to differentiate these conditions. A slightly bent knee, which may have existed for many weeks or months, negative to radiology, is suggestive of a displaced semilunar cartilage. An inflamed post-patellar pad can be felt enlarged when compared with that of the opposite side. A villous synovial membrane can be diagnosed by palpation and confirmed by thickened synovial fluid on aspiration, while a bony block to full extension, confirmed by a skiagram, is characteristic of a displaced spine of the tibia. A knee which can voluntarily be fully extended, painful and of long standing, negative to an X-ray examination, is almost always affected by adhesions.

These are all simple tests, which should prove helpful to practitioners when the problem of rest as opposed to movement is under consideration.

A knee, stiff and flexed, with limited movement, should be the subject of careful consideration before we decide upon any form of manipulation.

The prevention of adhesions.—In the treatment of joints, injured or diseased, our object is to obtain the best functional results. These are attained by rest, by movement, or by a combination of both. A movable joint is not necessarily the best functional result. I have already stated that an arthritic joint requires a rest until all inflammation has subsided. This is particularly true of a tuberculous joint, which not only resents movements, but yields the best functional results when recovery ends in a bony or short fibrous ankylosis. It is true that in certain cases, after many years of firm, fibrous ankylosis, a varying degree of voluntary movement takes place. This is especially the case in the hip, and is usually associated with a disappearance of the femoral head and neck when the joint surfaces have been relieved from contact. Nature brings about this result with less immediate risk than art, but I am often confronted with tuberculous joints where this movement has been their undoing, even after many years of presumed recovery. It is for this reason that I have advocated an *early* operative bony ankylosis in the adult. If disease is *advanced*, the results, especially in the hips, are not so effective. The operation aims at the removal of all diseased structure so that recovery is complete. This is not to be confused with the so-called bony extra-articular fixation, which makes no pretence at excising the tuberculous debris, and of which the most that can be expected is that it should act as a splint to secure rest until recovery takes place, with immobility later.

In certain cases of chronic arthritis of a septic or rheumatic type it is often possible to prevent the formation of firm adhesions when the active painful stage is passed. The patient may be allowed to move his joint within a painless area, or even the surgeon may possibly help. If the patient can move his joint voluntarily and without pain he may be allowed to do so several times a day. If passive movement is employed, once a day is sufficient, and is not likely to cause a reaction.

There are certain rules which we should observe before movements are undertaken either by the surgeon or the patient. A precise diagnosis should be made in

order to appreciate the pathological conditions. Torn ligaments or muscle insertions should be protected from strain; a joint may be moved in many directions provided the injured tissues are not stretched. Although passive movements must be carefully supervised, massage of a gentle type can safely be practised immediately following injury, even before effusion has taken place; it checks the effusion of lymph, relieves pain, and allows tissues to proceed to rapid recovery. The masseur should be warned, when necessary, against associating massage with movement, otherwise movement of the joint may disturb tissues which should be left at rest to undergo repairs. When a ligament is injured its anatomy and function should be visualized so that the movements allowed do not disturb the joint. It is a mistake to treat the joint as if an inflammation existed, because carefully conducted movements expedite function. When a ligament is torn I apply a pressure pad with a bandage to it and massage the area from time to time. Local effusion is lessened or even prevented by pressure, for pain is due to tension caused by effusion, and adhesions result from tension. If the joint itself is sprained, elastic pressure should be applied to minimize effusion, which strains injured tissues. In the stage of effusion I forbid any movement which causes pain. If this rule is neglected the ligaments may yield and lengthen under strain, and so allow of an erratic deflection of body-weight in the lower limb, especially noticeable in the ankle. When walking is allowed, precautions must be taken to secure a correct alignment.

Stiffness due to the fixation of joints.—I have frequently emphasized the fact that a short period of fixation of a healthy joint in a normal position never results in more than a passing stiffness in the child or young adult. This does not apply to the old. I lay stress on certain principles based upon a very extensive experience. The first is that a joint kept at rest should never be hyperextended. This is a form of trauma productive of firm adhesions in which the capsule of the joint participates both on its anterior and posterior aspect. It is advisable, therefore, if a joint has to be fixed, to keep it in a slightly flexed position. This will be particularly obvious to those of you who practised during the European war. You will never forget the very intractable rigidity of the metacarpophalangeal joints which resulted from the prolonged use of a misapplied dorsiflexion wrist splint. Hyperextension of phalanges resulted in a stiffness which months of massage and passive movements failed to affect, and brought massage into disrepute with the authorities. The most effective treatment consisted in keeping the metacarpophalangeal and the phalangeal joints flexed for three or four weeks before subjecting them to active or passive movements. The knee frequently presented a similar problem, due to sagging of the lower end of a fractured femur, and required a similar solution. I would, therefore, respectfully but emphatically impress upon you the dangers of hyperextension. Another point is to recognize the value of training muscles to contract even when they are not allowed to move a joint. This is best illustrated by the quadriceps. When the knee is kept at rest the muscle should be trained to pull upon the patella frequently each day. Other muscles can be educated similarly. These movements prevent adhesions forming within the muscles, and between them and their sheath, while later, when the joint is allowed to move, the muscles do their work more effectively. When the patient cannot be educated to perform these movements graduated faradism may be applied. Furthermore, we must make it a rule that movements should be practised in all joints which have muscular attachments associated with the articulation which is temporarily fixed. This is illustrated by the shoulder, wrist and fingers which are all in muscular association with the elbow.

A very intractable form of stiffness occurs in compound suppurative fractures about joints. This is due to a mild septic infiltration of the periarticular tissues, and does not respond favourably to forcible manipulations as applied to simple adhesions. Before any movement is attempted the fracture should be so splinted as

to prevent strain. The manipulation should be performed in stages, with intervals of a few days. During these intervals the joint should be rested on a splint. If the movement thus secured is retained, another stage may be attempted. If the joint becomes ankylosed in the position to which it has been moved no further attempt should be made to increase the range. If the resistance is so great that manipulation is ineffective, a slow, gradual stretching of the joint may prove successful. With this end in view the joint should be bandaged to a splint, with or without traction. Needless to say that in this type of case the joint should have been mobilized before the cicatrization of tissues occurred.

The mobilization of arthritic joints.—Before proceeding, we must know when a joint has recovered from disease. Apart from the important information supplied by successive skiagrams we must be familiar with the signs of cessation of destructive processes.

We may assume that a joint has recovered from disease when its range of movement is not diminished by use, or, in the case of a firm fibrous ankylosis, when its position does not alter by use. If an increase in movement follows the cessation of treatment, no matter how slowly, we should trust to active rather than to passive movements and these should be practised in the absence of weight-bearing. If this range of motion ceases and then remains stationary for a time, very cautiously conducted passive movements should be tried. This is in the nature of an experiment under close observation. We may practise gentle movements also in non-suppurative septic joints when acute symptoms have ended, and again carefully note the results. We must beware of inflammatory reaction. Whenever practicable I prefer active to passive movements; being voluntary, they are sure to be gentle and limited by pain while the muscle itself is truly exercised. The brain cells are employed here which is not the case in the passive type, nor are they employed when the faradic current is used. Unfortunately, active movements are at times neither possible nor effective. Passive movements, unless expertly administered, are apt to be overdone and to interfere with repair. They are often necessary in young children and in nervous people, but when possible they should be employed as an aid to the active type. The masseur, unless instructed, does not know that it is rarely necessary to put a joint through its movements passively more than once at a treatment, and that, for purposes of re-education, he should encourage exercises of the active type. I constantly meet with the evil effects of what I have termed the "pump-handle" method which causes the joint to become sore, swollen and stiff instead of becoming mobile. Passive movements should be carefully regulated and are intended to pave the way for voluntary motion; active movements require hardly any supervision.

Forcible manipulations.—This is a branch of manipulative surgery which has been so neglected as to bring considerable disrepute upon our profession. This neglect has proved a rich harvest to the bone-setter. I referred to it at some length in a recent lecture, so I will not now elaborate the subject. It is sufficient to say that we should mend our ways rather than abuse the unqualified. Dramatic successes at their hands should cause us to inquire as to the reasons; it is not wise or dignified to waste time in denouncing their many mistakes, for we cannot hide the fact that their successes are due to our failures, and that it is only by adding to our knowledge and perfecting our technique that we can hope to banish the bone-setter from our midst.

We have already discussed the type of joint which requires forcible movement. We have no time to enter into detail concerning the art of manipulation. There are, however, certain points to which attention should be drawn. Recent adhesions may be broken down under gas-and-oxygen, but when we deal with a firmer variety a more complete anæsthetic is required; otherwise, they cannot be dealt with effectively. Complete relaxation is essential; there must be no muscular resistance

We must not only know the normal range of movement, but, as this differs in various individuals, we must always take the healthy joint as a guide, comparing its movements during the operations with those of the affected side. If we neglect this, it is very easy to strain such a joint as the shoulder. Unless adhesions are unusually firm I prefer breaking them down completely rather than in stages. When the patient recovers from unconsciousness he should awaken with the position of his joint in full correction. This has an excellent moral effect.

I will describe the manipulations I employ when the knee is affected. Other joints are similarly treated, having regard to their anatomical differences.

With the patient lying on his back, the joint should first be fully flexed, and in that position the leg is rotated inwards and outwards. The rotation should be continued while the knee is slowly extended, care being taken that the extension is complete and remains so without pressure. The knee is again flexed over the surgeon's arm which is placed across the popliteal space. In this way the tibia is levered slightly forwards. If the adhesions are in front of the joint the knee should be flexed while the hip-joint is hyperextended, in order that extra tension may be put upon the structures in front and above the joint. This last movement is a very important one, and is generally neglected. After the special movements required to reduce a semilunar cartilage, both in the recent and in the old case, the rotary movement I have described should be practised. A semilunar cartilage may remain displaced for many months, the knee being in slight flexion, and is usually easily reduced. If, after the manipulation, the knee does not remain lax in full extension, one may be sure that the operation has failed.

Great care is needed in breaking down adhesions of the shoulder in elderly people. The head of the humerus should always be protected by placing the fist in the axilla. Fracture or dislocation is usually associated with external rotation. The scapula should be fixed until the arm is abducted to a right angle.

After-treatment following forcible manipulation.—Active movements should be begun as soon as the patient is awake. These may be assisted passively once a day. Effusion sometimes occurs in a joint, suggestive of the rupture of intra-articular bands. Unless the effusion is associated with a decreasing range of movement, it can be ignored and treatment can be continued with safety. If movement becomes more limited the joint will require rest. If, even in the presence of pain, the range of motion is increased by exercise, *rest is contra-indicated*. I would ask you to note that pain which is sharp and of *short duration* is negligible, but if pain *persists* when the joint is at rest it should be considered a danger signal. If the patient is able to exercise his limb freely, let him do so; it is more efficacious than any form of physio-therapy.

Movements, either gentle or forcible, must always give place to primary reduction of displacements or fractures. Whenever we speak of mobilization in fractures or dislocations we must presuppose their reduction. In the various fractures of the elbow-joint acute flexion *in the presence of displacement* is a dangerous proceeding. It may give rise to the spectre of ischæmic palsy and favours the production of bony developments known as myositis ossificans. It cannot be repeated too often that in this latter condition rest is imperative until the deposit of bone is ended, or absorption takes place. Even massage is contra-indicated. In ischæmic palsy, which is due to venous obstruction, we must relieve the immediate effusion of blood and, as soon as it is safe, reduce, by operation if necessary, all bone which obstructs movement. If reduction of displacement and freedom of muscle action are allowed there will be no need to fear loss of function, and neither massage nor passive movements are essential, although they may be helpful. Both massage and passive movements are necessary in old malunited fractures or displacements.

A correct alignment is of more value in fractures of long bones than an end-to-end apposition where there is even a slight angular deflection, and in the case of the

lower extremity we must realize that firm osseous union takes longer to occur than textbooks state. A fracture which resists movement, when tested by the hands, will often shorten when subjected to body-weight. This must be remembered, more particularly where the femur is concerned, if walking is allowed without adequate protection. I have often straightened a crooked thigh by a cross breaking strain, effected by manipulation, after eight weeks, without actually fracturing it. Firm union is usually rapid after this manœuvre, whereas, if an open operation is performed, a much longer period of rest is required, more especially if a plate is used. In the ambulatory treatment of fractures about the ankle a correct alignment, as elsewhere, is of paramount importance, and the greatest care should be taken to reduce the backward displacement of the foot. The astragalus must be in normal relationship to the articular surface of the tibia.

In congenital deformities the best examples of alternating manipulation and fixation may be illustrated by club-foot and congenital dislocation of the hip.

The short time at my disposal has prevented me from dealing with more than a few aspects of manipulation as a therapeutic measure, and with these other than briefly. There is so much that could be said on the manipulative reduction of displacements and deformities, on the manipulative indications in rheumatoid conditions, and on the assisted active movements in acute septic arthritis. This is, however, impossible, and I will conclude with a brief summary of the points which I desire to emphasize.

The prevention and limitations of adhesions.—Inflammatory symptoms are lessened by preventing strain on the injured parts, by obstructing local effusion by pressure, and by early massage of the injured structures.

If passive movements are practised they should be conducted without straining the injured structures.

Early active function should be encouraged. Torn structures should be shielded from an erratic deflection of body-weight.

Muscles should be voluntarily exercised, even when covered by splints, and adjacent joints should be kept mobile.

The differentiation between arthritis of the joint and adhesions about it.—With rare exceptions, a joint is not arthritic when movement is free, even in one direction. Restricted movements due to adhesions follow very rapidly upon injury.

Traumatic arthritis follows an injury in about a fortnight. A joint which is the seat of arthritis should not be moved until all inflammatory symptoms have subsided, and then under strict supervision and limitation.

If simple adhesions are to be broken down, and unless they are unusually firm, the joint should be put through its complete range of movement on one occasion.

Firm fibrous ankylosis following septic arthritis or compound fractures about joints.—The joint should be moved in stages of a few degrees followed by a few days' rest on a splint. If the range of movement is maintained, further movement and splintage is indicated. If the joint remains fixed in its new position, further movement is temporarily contra-indicated.

When movements of a joint are prescribed after fracture of a long bone, the fracture should be protected by splints.

Recent fractures through joints should not be mobilized without first reducing displacements. Ambulatory treatment should not be permitted unless reduction is complete, and only then if correct alignment is assured when the patient walks.

Discussion.—Mr. T. P. McMURRAY asked whether Sir Robert Jones thought that after a definite displacement of a semilunar cartilage a manipulation was ever successful in producing a permanent cure; by a permanent cure, he did not mean a reduction enabling the patient to walk about comfortably, but a cure which enabled him to carry out active athletic exercise, such as football.

Dr. EDGAR CYRIAX said that he had often met cases of "locked" vertebræ, and considered that such locking was due to reflex muscular spasm induced by impulses from the vertebral joints affected by the displacement. The application of vibrations or gentle pétrissage and carefully stretching the part, prepared the way for subsequent manipulation which, if successful, permanently removed the locking. He regarded locking of the vertebræ as pathognomonic of displacement.

Sir ROBERT JONES, in reply to Mr. McMurray, said that it was extremely difficult to determine whether a semilunar cartilage was absolutely displaced or not.

In reply to Dr. Cyriax: He had never yet seen a case in which there had been a definite locking of the vertebræ, and in which the skiagrams or any method of physical examination had shown a real displacement. If one could see these displacements by these means then it would be more easy to understand the mechanical causes which had led to the locking.